OPERATOR'S MANUAL

DM23XT, DM25XT, DM27XT, & DM28XT

XT Series Digital Multimeters

1994

WARNINGS AND PRECAUTIONS

PLEASE READ SECTION II WARNINGS AND PRECAUTIONS, SECTION III OPERATING INSTRUCTIONS, AND SECTION IV SPECIFICATIONS .

Exceeding the maximum limits of this instrument is DANGEROUS.

Exceeding these limits will expose you to physical injury or even death and will almost certainly damage your instrument. Even low-level voltages and currents are capable of causing serious injury or even death.

Please do not use this or any piece of test equipment without proper training. Individual functions and ranges have different overload limits. It is VERY IMPORTANT that you make yourself aware of these overload limits. Check the specifications of these overload limits. Check the specifications in SECTION IV.

WAVETEK

OPERATOR'S MANUAL

DM23XT, DM25XT, DM27XT, & DM28XT

XT Series Digital Multimeters

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Wavetek Corporation
Instruments Division
9045 Balboa Ave.
San Diego, CA 92123

Warranty

One Year Limited Warranty

XT Series Digital Multimeters are warranted in entirety against defects of material or workmanship which develop for any reason whatsoever, except abuse, within a period of one year following the date of purchase of the multimeter by the original purchaser. This warranty is extended by Wavetek Corporation only to the original purchaser or original user of the multimeter.

In the event a defect develops during the warranty period, Wavetek Corporation at its election will repair or replace the multimeter with a new or reconditioned model of equivalent quality. In order to obtain performance of any obligation of Wavetek Corporation under the warranty, the original purchaser or original user must return the defective multimeter postage prepaid. Refer to the service section of this manual for details.

In the event of replacement with a new or reconditioned model, the replacement unit will continue the warranty period of the original multimeter.

ANY IMPLIED WARRANTIES ARISING OUT OF THE SALE OF AN XT SERIES MULTIMETER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE ABOVE STATED ONE (1) YEAR PERIOD. MANUFACTURER SHALL NOT BE LIABLE FOR LOSS OF USE OF THE MULTIMETER OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, OR ECONOMIC LOSS OR FOR ANY CLAIM OR CLAIMS FOR SUCH DAMAGE, EXPENSES OR ECONOMIC LOSS.

Some states do not allow limitations on how long implied warranties last or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

Wavetek Corporation

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Unpacking and Inspection

Upon removing your new Digital Multimeter (DMM) from its packing, you should have the following items:

1. Digital Multimeter
2. Test Leads (1 black,1 red)
3. 9-Volt Battery (installed in meter)
4. Product Registration Card
5. Beaded Thermocouple Wire (DM23XT, DM28XT)
6. Operator's Manual
7. Alligator Clips (1 black,1 red - DM25XT, DM27XT, DM28XT)
8. Three fuses (Two installed, one spare inside meter)

If any of the above items are missing or are received in an unsatisfactory condition, please contact the distributor from whom you purchased the unit.

Familiarization

	Name	Function
1.	**3-1/2 Digit LCD**	Provides readout and annunciators.
2.	**DC/AC Button**	Selects DC or AC type voltage.
3.	**MAX Button**	Selects Maximum Reading Hold function (DM27XT, DM28XT).
4.	**Function/Range Switch**	Selects the Function and Range desired.
5.	**Temperature Input Jack**	Used for Type K thermocouple probe (DM23XT, DM28XT).
6.	**200mA Input Jack**	Input connector for current up to 200mA, L_x (Inductance), C_x (Capacitance).
7.	**10A Input Jack**	Input connector for high current.
8.	**V Ω Input Jack**	Input connector for volts, ohms, diode test, continuity, frequency and logic.
9.	**COM Input Jack**	Ground input connector.
10.	**Transistor Test Sockets**	Used for transistor h_{FE} measurements (DM23XT, DM25XT).
11.	**Safety Tester™**	Voltage Level Detector LEDs (DM23XT).
12.	**ON/OFF Button**	Turns power to meter on and off.
13.	**HOLD Button**	Freezes display reading when depressed (DM28XT).
14.	**HI/LO Button**	Selects high or low trigger level for frequency measurement (DM27XT).

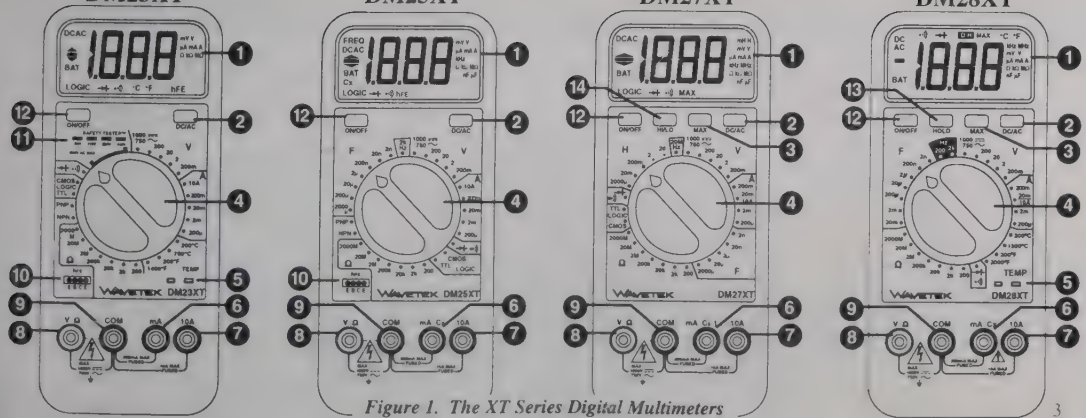

Figure 1. The XT Series Digital Multimeters

Section II Warnings and Precautions

Injury or death can occur even with low voltages and low currents. It is extremely important that you read these safety warnings before using your multimeter. Follow all safety practices and proper operating procedures for equipment being tested.

WARNINGS! "W"

When "W" is used in this manual it advises the user of a hazard that could result in serious injury or even death. "W" refers the user to the WARNINGS in this section, pages 6 and 7 as well as in Section III, Operating Instructions and in Section V, Maintenance Procedures.

PRECAUTIONS! "P"

When "P" is used in this manual it advises the user of a hazard that could cause damage or malfunction in the instrument. "P" refers the user to the PRECAUTIONS in this section, page 8 as well as in Section III, Operating Instructions and in Section V, Maintenance Procedures.

WARNINGS! "W"

"W" Exercise extreme caution when:
Measuring voltage above 20 volts, measuring current greater than 10mA, measuring AC power line with inductive loads, measuring AC power line during electrical storms.

"W" Always inspect your DMM, test leads and accessories for any sign of damage or abnormality before every use. If any abnormal conditions exist (i.e. broken or damaged test leads, cracked case, display not reading, etc.), do not attempt to take any measurements.

"W" Never ground yourself when taking electrical measurements. Do not touch exposed metal pipes, outlets, fixtures, etc., which might be at ground potential. Keep your body isolated from ground by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.

"W" Never touch exposed wiring, connections, test probe tips, or any live circuit conductors when attempting to make measurements.

"W" Never replace the protective fuse inside the DMM with a fuse other than the specified or approved equal fuse.

"W" Do not operate this instrument in an explosive atmosphere (i.e. in the presence of flammable gases or fumes, vapor or dust).

"W" Measuring voltage which exceeds the limits of the meter may damage the meter and expose the operator to a shock hazard. Always recognize the meter's voltage limits as stated on the front of the meter.

"W" Never apply more than 750VRMS between the COM input jack and earth ground.

"W" Never touch a voltage source when the test leads are plugged into a current jack.

PRECAUTIONS! "P"

"P" Calibration and repair should be performed by authorized factory or calibration personnel only.

"P" Before making any current measurements always perform a fuse check first.

"P" When testing for the presence of voltage or current, make sure the voltage or current ranges are functioning correctly. Take a reading of a known voltage or current before assuming a zero reading indicates no current or voltage.

"P" Range overload is indicated by either a "1."(DM23XT, DM25XT) or "OL" (DM27XT, DM28XT) in the display with all digits blanked. In this condition, the user must take immediate steps to remove the cause of the overload condition from the meter. Select the next higher range until a value is displayed. If overload condition still exists in the highest range, remove test leads from the measurement setup as it is beyond the range of the meter.

Voltage Measurements

1. Turn off power to the device under test and discharge all capacitors.
2. Plug the black test lead into the COM input jack on the DMM and connect the test lead tip to a grounded point (the reference point for measurement of voltage).
3. Set to desired voltage type (DC or AC) by pushing button marked DC/AC. Annunciator will display which voltage type is being measured.

4. Set the Function/Range switch to the desired voltage range.

NOTE

When the magnitude of the voltage to be measured is unknown, always start with the highest range.

5. Plug the red test lead into the V input jack on the DMM and connect the test lead tip to the circuit where a voltage measurement is required. Voltage is always measured in parallel across a test point.
6. Turn on power to the circuit/device to be measured and make the voltage measurement. Reduce the range setting if set too high until a satisfactory reading is obtained. For example:

Range	Measured Value	Display	Comments
1000VDC	18.75V	19	Reduce range
200VDC	18.75V	18.8	Reduce range
20VDC	18.75V	18.75	Correct range
2VDC	18.75V	1. / OL	Overload Cond.

7. After completing the measurement, turn off power to the circuit/device under test, discharge all capacitors and disconnect the DMM test leads.

NOTE

Use a High Voltage Probe for measurement needs >1000V.

Current Measurements

1. Turn off power to the device under test and discharge all capacitors.
2. Plug the black test lead into the COM input jack on the DMM and connect the test lead tip to the node that is the return branch for the current to be measured.
3. Set to desired current type (DC or AC) by pushing the DC/AC button. Annunciator will display which type is being measured.
4. Set the Function/Range switch to the highest amperage setting to match the current jack being used for the measurement. For example, 200mA setting for 200mA jack.
5. Plug the red test lead into the 10A current input jack of the DMM. If it is known that the current is less than 200mA, plug the red test lead into the 200mA input jack. Current measurements are

always made with the meter in series in the circuit where current is to be measured. The circuit must be broken and the meter put in series by placing the red test lead point to the test node for current. See Figure 2.

6. Turn on power to the circuit/device under test and make the current measurement. Reduce the setting from 200 mA range if range setting is too high.
7. After completing the measurement, turn off power to the circuit/device under test, discharge all capacitors, disconnect the DMM test leads and re-connect the circuit branch.

NOTE

The DM25XT, DM27XT, DM28XT are capable of 20 amps for 30 seconds. Use a current clamp for measurement needs > 10A.

Each current jack has a protective fuse installed to protect the meter from damage and the user from harm if a current larger than specified for the meter is applied at the input. If the quick-acting fuse does blow, replace with like fuse. See Section V, Fuses, for part numbers.

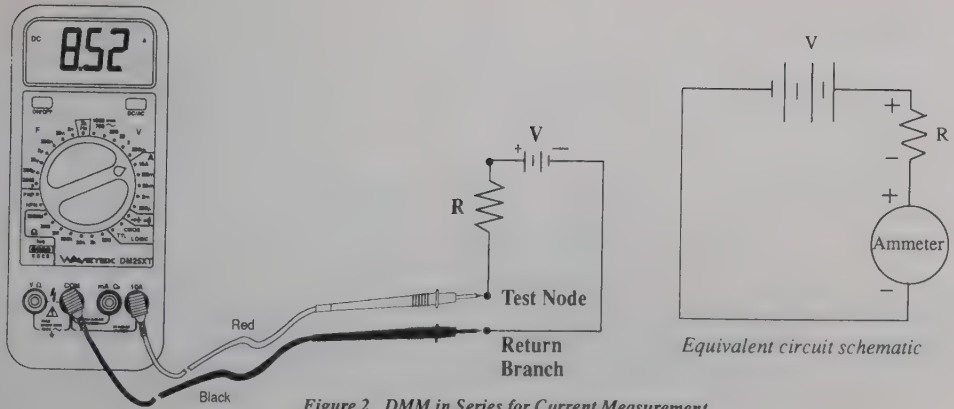

Figure 2. DMM in Series for Current Measurement

Resistance Measurements

1. Turn off any power to the resistor to be measured. Discharge any capacitors. Any voltage present during a resistance measurement will cause inaccurate readings and could damage the meter if exceeding the overload protection of 500VDC or AC.
2. Plug the black test lead into the COM input jack on the DMM and connect the test lead tip to one end of the resistor.
3. Set the Function/Range switch to the resistance range that gives the most accurate measurement reading. For example:

Range	Resistor Value	Display
2MΩ	1.915kΩ	.002MΩ
200kΩ	1.915kΩ	1.9kΩ
20kΩ	1.915kΩ	1.92kΩ
2kΩ	1.915kΩ	1.915kΩ
200Ω	1.915kΩ	1. / OL (Overload)

4. Plug the red test lead into the Ω input jack on the DMM and connect the test lead tip to the other end of the resistor. A resistor is non-polarized and resistance measurements do not require attention to which test lead is placed at which end of the resistor.
5. After completing the measurement, disconnect the DMM test leads.
6. Open circuits will be displayed as an overload condition.

NOTE

Test lead resistance can interfere when measuring low resistance readings and should be subtracted from resistance measurements for accuracy. Select 200Ω resistance range and make a firm contact between the two test lead points (short them together). The display value is the test lead resistance to be subtracted.

When using 2000MΩ Range

The 2000MΩ range has a fixed 10-count offset in the reading. When the test leads are shorted together in this range, the meter will display 010. This residual reading must be subtracted from the reading obtained in step 4 when this range is used. For example, when measuring 1100MΩ on the 2000MΩ range, the display will read 1110, from which the 10 residual is subtracted to obtain the actual resistance of 1100MΩ.

Logic Measurements

The logic measurement function can be used to test both TTL and CMOS digital circuitry.

1. Select the logic function desired (TTL or CMOS) with the Function Switch.
2. Insert the black test lead into the COM input jack on the DMM and connect the test lead tip to the common bus of the logic circuitry to be measured.
3. Insert the red test lead into the V Ω input jack on the DMM and connect the test lead tip to the point to be tested.
4. With a logic high pulse (1), the ▔ indicator will display in the LCD. With a logic low pulse (0), the ▁ indicator will appear in the LCD and a beeping sound will emit.

Diode Test

The diode test measures the forward bias of a diode junction.

1. Turn off power to the device under test and discharge all capacitors.
2. Plug the black test lead into the COM input jack on the DMM and connect the test lead tip to the cathode of the diode. See Figure 3.

3. Set the Function/range switch to →+•)).
4. Plug the red test lead into the V Ω input jack on the DMM and connect the test lead tip to the anode of the diode. The meter's display indicates the forward voltage drop (approximately 0.7V for silicon diode or 0.4V for germanium diode). Meter will display overload condition for an open diode.
5. Reverse the test lead connections to the diode to perform a reverse bias test of the diode junction. See Figure 3. An "OL" or "1." (overload) indicates a good diode because a good diode junction in reverse bias has practically infinite resistance.
6. After completing the measurement, disconnect the DMM test leads.

NOTE

Overload conditions for both reverse and forward bias tests indicate an open diode. A low voltage reading for both bias tests indicates a shorted diode.

If the diode is shunted by a resistor of 1000 ohms or less, it must be removed from the circuit before taking the measurement.

Bipolar transistor junctions may be tested in the same manner described above as emitter-base and base-collector junctions are diode junctions.

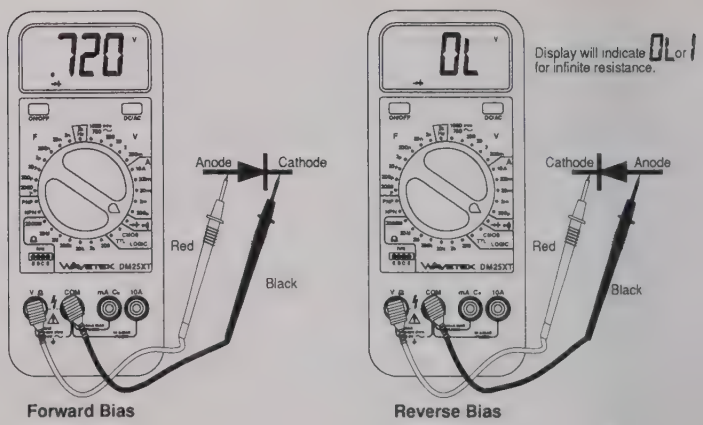

Figure 3.
Good Diode in
Forward and Reverse Bias Modes

Continuity Test

The Continuity test checks for electrical continuity between two contact points.

1. Plug the black test lead into the COM input jack on the DMM and connect the test lead point to one of the contact points.
2. Set the Function/Range switch to →+•)).
3. Plug the red test lead into the V Ω input jack on the DMM and connect the test lead point to the other contact point. The internal beeper will emit a tone when resistance is less than 75 Ω between the two contact points.
4. After completing the measurement, disconnect the DMM test leads.

Safety Tester™ (DM23XT)

1. This feature works when the Function/Range switch is set to any knob position within the Safety Tester range band. Set the switch to Safety Tester and note the LCD is blank. This feature does not work off the internal DMM battery. It is powered by the actual voltage that is being measured.
2. Plug the black test lead into the COM input jack on the DMM. Connect the test lead tip to a ground point (reference) for the voltage to be measured.
3. Plug the red test lead in the V Ω input jack on the DMM. Connect the test lead tip to the point to be measured for voltage. Note the maximum input limitation of 550VAC for the Safety Tester.
4. The Safety Tester LEDs will light in sequence up to the threshold of AC voltage that is present. See Figure 4.

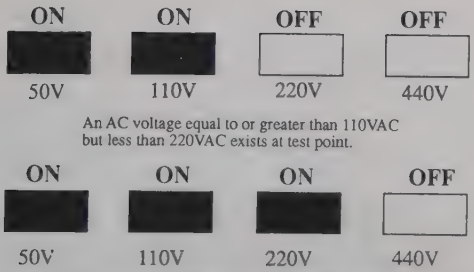

Figure 4. Safety Tester™ Voltage Level Examples

Inductance Measurements (DM27XT)

1. Turn off power to the device under test and discharge all capacitors.
2. Plug the black test lead into the COM input jack on the DMM and connect the test lead tip to one end of the inductor.
3. Set the Function/Range switch to the inductance range that gives the most accurate measurement reading. For examples of correct range choice, see Resistance Measurements, page 13.
4. Plug the red test lead into the 200mA (L_x) jack on the DMM and connect the test lead tip to the other end of the inductor.
5. Read the inductance value in the display.
6. Disconnect the DMM test leads.

NOTE

Different test frequencies and response times apply to the individual inductance ranges. See Section IV Specifications for details.

Capacitance Measurements (DM25XT, DM27XT, DM28XT)

1. Turn off power to the device under test and discharge all capacitors.
2. Discharge all voltage from the capacitor before measuring its capacitance value.

> **NOTE**
>
> A safe way to discharge a capacitor is to connect a 100kΩ resistor across the two capacitor leads.

3. Plug the black test lead into the COM input jack on the DMM and connect the test lead tip to one end of the discharged capacitor. When measuring electrolytic capacitors, observe correct polarity. Connect the COM test lead to the negative capacitor lead marked — .
4. Set the Function/Range switch to the capacitance range that gives the most accurate measurement reading.
5. Plug the red test lead into the 200mA (C_x) input jack on the DMM and connect the test lead tip to the other end of the discharged capacitor. Read the capacitance value in the display.
6. Disconnect the DMM test leads.

NOTE

Different test frequencies and response times apply to the individual capacitance ranges. See Section IV Specifications for details.

The DM25XT, DM27XT, and DM28XT have a residual capacitance value of approximately 30 pF in the 2 nF range. When using the 2 nF range, note the residual capacitance value and subtract this value from the measured capacitance. For example, set the Function/Range switch to 2 nF and insert test leads into "COM" and "MA/Cx" jacks. Display indicates 35 pF. Measure capacitor, display indicates 185 pF. Capacitor's value is 185 pF - 35 pF = 150 pF.

If any voltage is present on a capacitor when measuring, the mA fuse will blow. If the meter does not read a capacitance value, always check the mA fuse for continuity.

Frequency Measurements (DM25XT)

1. Set Function/Range switch to 2 kHz Frequency range.
2. Plug black test lead into COM input jack on the DMM and plug red test lead into the V Ω input jack
3. Determine that the amplitude level of the signal to be measured is not greater than the input voltage limit. The signal amplitude must also be greater than the sensitivity level.

4. Attach the probe tips to the signal source. Read the frequency value in the display.
5. Disconnect the DMM test leads.

Frequency Measurements (DM27XT)

1. Set the Function/Range switch to the 20MHz Frequency range. The DM27XT has autoranging frequency capability. It is not necessary to know the range as the meter will automatically range up or down to display the best resolution. There are two input sensitivity settings, HI or LO.
2. Default is LO for sensitivity response to the input signal.
3. Plug black test lead into COM input jack on the DMM and plug red test lead into the V Ω input jack.
4. Attach the probe tips to the signal source. The LCD will display the frequency value.
5. If display is unstable, push HI/LO button to switch trigger level to HI (LCD will display ▁▔) to obtain a stable frequency reading. (See specifications, Section IV, for amplitudes and frequencies associated with each trigger level).

"W" The frequency ranges of the DM25XT and DM27XT have overload protection to 500VDC/350 VAC RMS—DO NOT EXCEED THIS LIMIT. Serious personal injury or even death could result.

Frequency Measurements (DM28XT)

1. Set the Function/Range switch to the desired range. If uncertain, start in the 2kHz range.
2. Plug black test lead into COM input jack on the DMM and plug red test lead into the V Ω input jack.
3. Attach the probe tips to the signal source. The LCD will display the frequency value.
4. For better resolution of frequencies below 200Hz switch function switch from 2kHz position to 200.

"W"	**The frequency ranges of the DM28XT have overload protection to 500VDC/AC RMS —DO NOT EXCEED THIS LIMIT— Serious personal injury or even death could result.**

"P"	**If measuring a noisy line voltage, high voltage spikes can damage meter.**

Temperature Measurements (DM23XT, DM28XT)

1. Remove test leads from meter.
2. Plug in Type K thermocouple probe to the built-in temperature socket on the front of the meter.
3. Set the Function/Range switch to the range and temperature scale desired (°C or °F).
4. Make temperature measurement and read value displayed.
5. Remove thermocouple probe from meter when finished.

NOTE

Operating temperature for Beaded Type K Thermocouple Probe is -50°C (-58°F) to 200°C (392°F). For additional available temperature probes, please refer to the Service Test Instrumentation Catalog.

Transistor h_{FE} Measurements (DM23XT, DM25XT)

1. Transistor must be out of circuit. Set the Function/Range switch to the PNP or NPN position, according to the type of transistor to be measured.
2. Plug the emitter, base and collector leads of the transistor into the correct holes in either the NPN or the PNP transistor test socket. Read the h_{FE} beta, (DC current gain) in the display.

MAX Function (DM27XT, DM28XT)

This function is enabled by pushing MAX button once (MAX will show in display). When MAX function is enabled, the display will freeze the highest measurement reading while the meter is receiving the same type of signal. In voltage, the maximum positive DC voltage will remain displayed, the "maximum" negative DC voltage (most negative), or the highest AC voltage. The MAX function is designed to display a maximum stable signal. The response time is approximately 2 seconds, which allows momentary spikes to be ignored, and a stable maximum reading to be retained. MAX is disabled in the Frequency function of the DM27XT.

HOLD Function (DM28XT)

This function enables the user to "freeze" a measurement reading and then remove the test leads while the reading remains displayed on the LCD. HOLD is useful when it is necessary to pay very close attention to your work. Freeze the display by depressing the HOLD button. Pushing the HOLD button again releases the display.

Safety Test Leads

The test leads included with your meter have shrouded banana plugs to eliminate the possibility of shock if the plugs accidentally pull out of the meter while making a measurement. The leads also have insulated probe tips to avoid causing shorts when making measurements in dense component areas. This insulation can be removed if desired. Make one cut down its length with a sharp utility knife and peel it off. Removal of insulation is not recommended unless it prevents making measurements in a particular application. Test leads have threaded bases on the probe tips to accept screw-on alligator clips (included with DM25XT, DM27XT, and DM28XT, available as separate item for DM23XT; order p/n AL244). The replacement part number for Safety Test Leads is TL30.

Auto Power Off

All XT Series models feature automatic shutoff after a given amount of time that the meter has been left **without a change of the range or function switch**. This feature helps conserve battery life. The DM23XT and DM25XT will automatically turn off after 45 minutes; the DM27XT and DM28XT will automatically turn off after 60 minutes. To turn the meter back on, simply push ON/OFF button twice, turning meter off then back on, or change the Function/Range knob to a different setting.

Input Warning Beeper

1. The Input Warning Beeper is a feature to protect the meter and you from unintentional misuse. If the DMM is set to measure a voltage while the test leads are plugged into a current jack, very high current could result when the test lead tips are placed to the voltage test point.
2. This feature warns you that the test lead needs to be changed from a current jack to the voltage jack.
3. See table on next page for examples of when the Input Warning Beeper occurs.

Test Lead Placement	Function/Range Switch Setting	Input Warning Beeper
10A jack	10A	No
10A jack	Safety Tester™ (DM23XT)	No
10A jack	200µA -200mA	Yes
10A jack	Volts, Ω	Yes
200mA jack	200µA -200mA	No
200mA jack	Safety Tester™ (DM23XT)	No
200mA jack	10A	Yes
200mA jack	V, Ω	Yes

4. All current ranges are fused with fast acting ceramic fuses as an added protection. See Section IV for fuse specifications.

General Specifications

Display:	3-1/2 digit LCD, 1999 counts, 0.7" high numerals, with unit annunciators and function symbols
Polarity Indication:	Automatic, positive implied, negative indicated
Zero Adjustment:	Automatic
Overrange Indication:	"1." DM23XT, DM25XT; "OL" DM27XT, DM28XT
Low Batt. Indication:	"BAT" is displayed when the battery voltage drops below accurate operating level. is displayed in DM27XT and DM28XT. Change battery when low battery is indicated as measurement values are not accurate when DMM battery is low.
Display Update Rate:	2.5 per second, nominal
Operating Temperature:	0°C to 50°C, 0 to 70% Relative Humidity

Temperature Coefficient:	0.1 X (specified accuracy) per °C. (0°C to 18°C, 28°C to 50°C)
Storage Temperature:	-20°C to 60°C, 0 to 80% RH with battery removed from meter
Power:	Standard 9-volt transistor battery, NEDA 1604, JIS 006P, IEC 6F22. Meters have Auto Power Off after 45 minutes of no function or range change (60 minutes for DM27XT and DM28XT).
Battery Life:	300 hours (typical alkaline, will vary with function and application).

NOTE

Capacitance, Inductance, and Frequency measurements consume large amounts of battery power. If you use your meter heavily in those functions, the battery life will be reduced.

Dimensions (H x W x D):	7.2 x 3.1 x 1.5 inches (18.3 x 7.9 x 3.8 cm)
Weight:	11 ounces, 311 grams (including battery)
Accessories Included:	One pair test leads, one spare fuse, battery and Operator's Manual (all meters); beaded thermocouple Type K probe (DM23XT, DM28XT), one pair alligator clips, screw-on, (DM25XT, DM27XT, DM28XT)
Safety:	Certified to meet IEC1010, Part I. Installation Cat. 2.

Electrical Specifications (Stated accuracy at 23°C ±5°C, <75% RH)

DC VOLTS	DM23XT / DM25XT / DM27XT / DM28XT
Ranges	200mV, 2V, 20V, 200V, 1000V
Accuracy	±0.5% + 1
Resolution, 200mV Range	100µV
Input Impedance	10MΩ
Overload Protection	200mV Range - 500VDC/350VRMS 15sec; All Other Ranges - 1000VDC/750VRMS

AC VOLTS	DM23XT / DM25XT / DM27XT / DM28XT
Ranges	200mV, 2V, 20V, 200V, 750V
Accuracy	±1%+4, 50 - 500Hz; ±1.5%+4, 500 - 1kHz
Resolution, 200mV Range	100µV
Input Impedance	10MΩ
Overload Protection	200mV Range - 500VDC/350VRMS 15sec; All Other Ranges - 1000VDC/750VRMS

DC CURRENT		DM23XT	DM25XT	DM27XT	DM28XT
Ranges		200µ, 2m, 20m, 200m, 10A	200µ, 2m, 20m, 200m, 10A (20A for 30 sec.)		
Accuracy	200 µA to 200 mA Ranges	±1%+1			
	10A Range	±2%+3			
Resolution	200 µA Range	0.1 µA			
Input Protection	mA Input	F500 mA/250V fast acting ceramic fuse			
	10A Input	10A/600V fast acting ceramic fuse	20A/600V fast acting ceramic fuse		

AC CURRENT		DM23XT	DM25XT	DM27XT	DM28XT
Ranges		200µ, 2m, 20m, 200m, 10A	200µ, 2m, 20m, 200m, 10A (20A for 30 sec.)		
Accuracy	All Other Ranges	±1.5%+4 (50-500 Hz)			
	10A Range	±2.5%+4 (50-500 Hz)			
Resolution	200 µA range	0.1 µA			
Input Protection	mA Input	F500 mA/250V fast acting ceramic fuse			
	10A Input	10A/600V fast acting ceramic fuse	20A/600V fast acting ceramic fuse		

RESISTANCE		DM23XT / DM25XT / DM27XT / DM28XT
Ranges		200Ω, 2kΩ, 20kΩ, 200kΩ, 2MΩ, 20MΩ, 2000MΩ
Accuracy	200Ω to 2MΩ Range	±1%+4
Accuracy	20MΩ Range	±2%+5
Accuracy	2000MΩ Range	±[(5%-10) +10]
Resolution	200Ω Range	0.1Ω
Open Circuit Voltage	200Ω, 2000MΩ Ranges	3VDC
	All Other Ranges	0.3VDC
Overload Protection		500VDC/AC RMS

CONTINUITY TEST	DM23XT / DM25XT / DM27XT / DM28XT
Beeper	< 75Ω
Response Time	≈ 500msec
Overload Protection	500VDC/AC RMS

DIODE TEST	DM23XT / DM25XT / DM27XT / DM28XT
Accuracy	±1.5% +1
Test Current/Voltage	1.0mA, 3.0VDC typical
Overload Protection	500 VDC/ACRMS

LOGIC		DM23XT / DM25XT / DM27XT	
		TTL	CMOS
Thresholds	Logic 1 (HI)	2.8V ± 0.8V	4.0V ± 1.0
	Logic 0 (LO)	0.8V ± 0.5V	2.0V ± 0.5V
	Test Voltage	5VDC	>5VDC and <10VDC
	Frequency Response	20MHz	20MHz
	Pulse Width	25nS min	25nS min
	Duty Cycle	> 20% and < 80%	> 20% and < 80%
	Pulse Rise Time	10µsec	10µsec
	Pulse Repetition Rate	1Mpps	1Mpps
	Indication	40msec beep at logic 0 (LO)	40msec beep at logic 0 (LO)

CAPACITANCE	DM25XT	DM27XT	DM28XT
Ranges	2 nF, 20 nF, 200 nF, 2 µF, 20 µF, 200 µF, 2000 µF	2 nF, 20 nF, 2 µF, 20 µF, 2000 µF	2 nF, 200 nF, 2 µF, 20 µF, 200 µF, 2 mF, 20 mF
Accuracy 2 nF*	±2%+4	±5%+10	±3%+4
20 nF to 20 µF Range	±2%+4	±5%+10	±3%+1
200 nF, 2000 µF Range	±2%+4	±5%+10	-
200 µF to 20 mF Range	-	-	±5%+1
Overload Protection	F0.5A/250V fast acting ceramic fuse		
Test Frequency/Response Time			
2 nF, 20 nF, 200 nF	1000 Hz / 1.5 sec.	200 Hz / 8 sec	1000 Hz / 1.5 sec.
2 µF, 20 µF	100 Hz / 1 sec.	200 Hz / 8 sec	1000 Hz, 100 Hz - 1.5 sec.
200 µF	10 Hz / 5 sec.		10 Hz / 5 sec.
2000 µF	10 Hz / 5 sec.	2 Hz / 20 sec.	10 Hz / 5 sec.

** 2 nF range, including test leads, may have up to 35 residual counts of offset. Subtract this offset from reading to derive correct measurement.*

NOTE: The DM27XT uses 6 seconds to discharge its internal capacitors and autozero once a large capacitor is removed from the test leads.

INDUCTANCE	DM27XT
Ranges	2m, 20m, 200m, 2H, 20H
Accuracy	±5%+10
Test Frequency 2mH, 20mH	1000Hz
All other ranges	200Hz
Overload Protection	F0.5A/250V fast acting ceramic fuse

FREQUENCY	DM25XT	DM27XT	DM28XT
Ranges	2kHz (10Hz to 2kHz)	2kHz - 20MHz, autoranging (10Hz to 20MHz)	200, 2kHz
Accuracy	±0.5%+3 > 10Hz	±0.5%+3 > 10Hz	±0.5%+3 > 0
Resolution	1Hz	1Hz	0.1Hz
Sensitivity	1VRMS	LOW: 500mVRMS 10-10MHz; 1VRMS 10MHz-20MHz (TTL Only) HIGH: 2VRMS 10 - 10MHz; 5VRMS 10MHz-20MHz (TTL Only)	2VRMS
Minimum Pulse Width	> 150µsec	≥25nS	> 150µsec
Duty Cycle Limits	> 30% and <70%	N/A	> 30% and <70%
Overload Protection	500VDC/RMS	500VDC/RMS	500VDC/RMS

TRANSISTOR h_{FE}	DM23XT DM25XT	DM27XT / DM28XT
Range	0 - 1000	N/A
Base Current	≈10µADC	
Voltage C-E	≈3.0VDC	
Types	NPN, PNP	

TEMPERATURE	DM23XT			DM28XT		
Type K Thermocouple	Range	Resolution	Accuracy	Range	Resolution	Accuracy
	200°C	0.1°C	-20°C to 0°C ±1%+2°C	200°C	0.1°C	-30°C to 200°C ±1%+0.7°C
	200°C	0.1°C	0°C to 200°C ±1%+2°C	1300°C	1°C	201°C to 1300°C ±1%+1°C
	750°C	1°C	200°C to 750°C ±3% +2°C			
	200°F	0.1°F	4°F to 32°F ±1%+4°F	200°F	0.1°F	-22°F to 200°F ±1%+1.3°F
	200°F	0.1°F	32°F to 200°F ±1%+4°F	2000°F	1°F	201°F to 2000°F ±1%+2°F
	1400°F	1°F	200°F to 1400°F ±3%+4°F			

SAFETY TESTER™	DM23XT
Signal Voltage Levels	50V, 110V, 220V, 440V AC
Overload Protection	550V RMS for 30 minutes

AUTO POWER OFF	DM23XT	DM25XT	DM27XT	DM28XT
Time-Out Period	≈ 45 minutes	≈ 45 minutes	≈ 60 minutes	≈ 60 minutes

Troubleshooting

If there appears to be a malfunction during the operation of the meter, the following steps should be performed in order to isolate the cause of the problem:

1. Check the battery voltage and/or connection.
2. Review the operating instructions for possible mistakes in operating procedure.
3. Inspect and test the Test Leads for a broken or intermittent connection.
4. Inspect and test the fuse. If it is necessary to replace the fuse, be sure to install one with the proper current and voltage values, see Fuse Replacement.

Fuse Replacement

"W" To prevent electrical shock hazard, turn off the multimeter and any device or circuit under test and disconnect the test leads before removing the rear cover.

"W" Use only an equivalent fuse to the one specified. Use of an incorrect fuse could result in serious injury or even death.

The XT Series meters use an input protection fuse for both the 200 mA and 10A current inputs. Make sure replacement fuse is equivalent to the one specified.

1. After disconnecting test leads and turning off the multimeter, place meter face down and remove the rear case by unscrewing the four screws that secure it to the front case (it is not necessary to remove the two screws securing the tilt bail).
2. Remove blown fuse, replace with fuse of same type only:
   - 10A input (DM23XT, large fuse), 10A @ 600V: Wavetek p/n FP325
   - 10A input (DM25XT, DM27XT, DM28XT large fuse), 20A @ 600V: Wavetek p/n FP425
   - 200 mA input (all models, small fuse), F500 mA @ 250V: Wavetek p/n FP225
3. Replace rear case and four screws.

A spare small fuse (F500 mA @ 250V) is provided inside the meter's case. Order replacement fuses from your local distributor or the factory's Instrument Repair Department.

Battery Replacement

"P"	**Failure to turn off the multimeter before installing the battery could result in damage to the instrument and to the battery if the battery is connected incorrectly to the multimeter.**

1. After disconnecting test leads and turning off the multimeter, place meter face down and remove the rear case by unscrewing the four screws that secure it to the front case (it is not necessary to remove the two screws securing the tilt bail).
2. Remove battery and replace with a new NEDA type 1604 or equivalent 9-volt alkaline battery. Wind the excess lead length one half turn around the battery clip and install battery.
3. Replace rear case and the four screws.

Cleaning the Meter

Use only mild detergent and warm water to clean the meter. Do not use aromatic hydrocarbons or chlorinated solvents.

Assembly Parts List

When servicing the meter, it is recommended that only Wavetek replacement parts be used. Replacement parts for the meter are listed in the following table.

Parts Description	Part Number
Battery (Alkaline, 9-volt)	NEDA 1604
Case, Front	1000-0823-00
Case, Rear	1000-0822-00
Tilt Stand	1000-0825-00
Tilt Stand holder	1000-0824-00

* The Service Manual is not included with your meter but may be ordered separately from the factory.

Optional Accessories

The following accessories can be ordered for use with the XT Series multimeters.

Test Leads

TL30	Standard replacement test leads
AL244	Replacement alligator clips for use with TL30 test leads
DL243B	Deluxe Test Lead Kit. Includes silicone rubber insulated lead wires, push-on test probes, insulated alligator clips, spade lugs, and a nylon carrying case.
DL248B	Deluxe Test Lead Kit. Includes silicone rubber insulated test lead wires, push-on test probes, insulated alligator clips, spring hooks, a two-inch insulated needle tip, spade lugs, and a nylon carrying case

Carrying Cases/Holsters

VC30	Reinforced, fabric lined vinyl case. Fits test leads, manual and meter without holster
VC231	Reinforced, fabric lined vinyl case. Fits test leads, manual and meter with holster (H30)
H30	Protective thermoplastic rubber holster (black)
H30Y	Protective thermoplastic rubber holster (yellow)

Probes/Clamps

HV231-10	40 KVDC high voltage probe
RF241	650 MHz RF probe
CT231	150A AC clamp-on current probe (40 Hz to 500 Hz)
CT232	1000A AC clamp-on current probe (40 Hz to 10 kHz)
CT233	600A AC/DC clamp-on current probe (0 to 400 Hz)
CT234A	400A AC clamp-on current probe (40 to 1 kHz)
TC253	Temperature converter (probe not included). Not required for DM23XT or DM28XT.
TP254	General purpose Type K thermocouple probe.
TP255	Type K thermocouple probe with beaded end. TC253 also required except with DM23XT or DM28XT.

Please refer to the Wavetek Service Test Instruments catalog for our complete line of temperature probes.

Factory Service

In the United States and Canada, the limited warranty period is one year. For further warranty information, or for warranty information in Europe, please contact the following:

U.S. and CANADA:
Wavetek Corporation
Instruments Division
9045 Balboa Avenue, Suite A
San Diego, CA 92123-1511
Tel: (619) 279-2200 ext. 670
Fax: (619) 627-0132

EUROPE:
Wavetek Ltd
Hurricane Way
Norwich, NR6 6JB
England
Tel: (44/603) 404824
Fax: (44/603) 483670

Warranty Repair

Any Wavetek DMM within its warranty period and claimed to be defective should be returned to Wavetek. Please contact the appropriate address (above) for warranty repair information.

Non-Warranty Repair

Any out-of-warranty Wavetek DMM that is defective, but repairable, may be repaired by an authorized Service Center or by Wavetek. The repaired unit carries a six (6) month warranty. Inside the U.S. or in Canada, please contact the Instruments Division of Wavetek Corp. or an authorized Service Center for the current out-of-warranty repair rates. In Europe, contact Wavetek Ltd. for out-of-warranty repair information. (See addresses and phones on previous page.)

Shipping Instructions

DMMs returned for repair or calibration should be accompanied by the following: company name, customer's name, address, telephone number, proof of purchase (for warranty repairs), **a written description of the problem encountered or service required,** and a P.O., check, or money order for the appropriate service charge. Please return the test leads with the meter.

In the U.S. and Canada, service charges should be remitted in the form of a check, a money order, or a purchase order made payable to Wavetek Corp. The DMM should be shipped with transportation charges prepaid to the following address:

Wavetek Corp.
Instruments Division
9045 Balboa Avenue, Suite A
San Diego, CA 92123-1511
Tel: 800-227-9781 ext. 670 Fax: (619) 627-0130

In Europe, please contact Wavetek Ltd. for payment and transportation methods.

Wavetek Ltd
Hurricane Way
Norwich, NR6 6JB
England
Tel: (44/603) 404824, Fax: (44/603) 483670

Optional Accessories Available:		DM23XT	DM25XT	DM27XT	DM28XT
VC30	Vinyl Carrying Case (Meter only)	√	√	√	√
VC231	Vinyl Carrying Case (Meter w/ H30 Holster)	√	√	√	√
DL243B	Basic Test Lead Kit	√	√	√	√
DL248B	Deluxe Test Lead Kit	√	√	√	√
H30/H30Y	Protective Holster (Black/Yellow)	√	√	√	√
TL30	Replacement Safety Test Leads	√	√	√	√
CT231	AC Current Clamp	√	√	√	√
CT233	AC & DC Current Clamp	√	√	√	√
HV231-10	High Voltage Probe	√	√	√	√
RF241	RF Probe	√	√	√	√
TC253	Temperature Converter	Temp Incl.	√	√	Temp Incl.
TP254	General Purpose Temperature Probe	Incl.	√	√	Incl.

In U.S.:
Wavetek Corporation, Instruments Division
9045 Balboa Ave., San Diego, CA 92123-1511

In Europe:
Wavetek Ltd.
Hurricane Way, Norwich, NR6 6JB, England